REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-18 are pending in this application. Claims 1-14 are amended and Claims 15-18 are added by the present amendment.

Applicant respectfully submits that amendments to the claims and new claims find support in the application as originally filed. Claim 1 is supported by the recitation of the previously presented Claim 1 and the descriptions in page 11, lines 3-10 of the specification; Claim 15 is supported by the recitation of the previously presented Claim 1 and the descriptions in page 8, line 25 to page 9, line 7; page 10, lines 8-15; and page 11, line 3 to page 12, line 6 of the specification; Claim 16 is supported by the recitation of the previously presented Claim 1 and the descriptions in page 7, line 29 to page 8, line 32 of the specification; Claim 17 is supported by the recitation of the previously presented Claim 1 and the descriptions in page 9, line 24 to page 10, line 15 of the specification; Claim 18 is supported by the recitation of the previously presented Claim 1 and the descriptions in page 10, line 23 to page 11, line 2 of the specification; amendments to Claim 13 are supported by the recitation of the previously presented Claim 13 and the descriptions in page 4, line 25 to page 5, line 9; page 11, lines 3-10; and page 15, line 3 to page 16, line 24 of the specification; and amendments to Claim 14 are supported by the recitation of the previously presented Claim 13 and the descriptions in page 8, line 25 to page 9, line 7; page 10, lines 8-15; and page 11, line 3 to page 12, line 6 of the specification. Thus, no new matter is added.

In the outstanding Office Action dated November 21, 2008, Claims 1-14 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,622,567 to Kojima et al. (herein "Kojima"). Applicant respectfully traverses that rejection.

Applicant respectfully submits that Kojima fails to teach or suggest each of the features of independent Claims 1 and 13. For example, Applicant respectfully submits that Kojima fails to teach or suggest a method of forming a film upon a substrate that includes forming a thin film on a test substrate to obtain film fitness distribution information before an intended thin film is formed.

In addition, Kojima neither teaches nor suggests any of a structure for obtaining the film-thickness of the deposit produced on the substrate within a unit time in each of the N (N: more than one) arrangements on the test substrate prepared for use in collecting information, and Kojima fails to disclose or suggest a structure for selecting a combination of the deposition times which is the closest to the desired film-thickness distribution, based on the film-thickness of the deposit produced within the unit time obtained by the above structure for obtaining the film thickness.

Amended Claim 1 is directed to a method of forming a film upon a substrate by means of a laser evacuation method wherein a laser beam is shined upon a target placed within an evacuated deposition chamber so that target material in a portion of the target surface is irradiated by the laser beam evaporates, and the evaporated target material is deposited upon a surface of the substrate supported by a substrate holder within the deposition chamber.

In a preliminary step, information on the distribution of the thickness of film deposited upon a test substrate prepared for use in collecting information is obtained in advance over a fixed irradiation time while shining the laser beam upon the target in the state in which there is a fixed positional relationship between the spatial positions of the test substrate and the point of incidence of the laser beam upon the target, or while shining the laser beam upon the target while rotating the test substrate.

According to a non-limiting embodiment of Claim 1 or 13, by determining plural arrangements related to a positional relationship between a two dimensional position on the surface of the test substrate and the point of incidence of the laser beam upon the target opposed to the position on the surface of the substrate to thereby obtain in advance the film-thickness distribution per unit time at each of the arrangements in the preliminary step, it is possible to form a thin film with a considerably uniform film-thickness distribution by adjusting the length of the deposition time in the main step.[1]

In the main step, the deposition time at each relative position may be adjusted based on the film-thickness distribution information obtained in advance in the preliminary step while spatially moving or rotating the substrate or substrate holder about a specific central axis of rotation relative to the point of incidence of the laser beam to the target, or while performing both the relative rotation and the relative movement. An inverse problem is solved by using a uniform or a desired film-thickness distribution and the film-thickness distribution information obtained in advance at each relative position.

By solving the inverse problem in this step, according to an embodiment of Claim 1 or 13, it is possible to correctly determine the deposition time for the advance information obtained in the preliminary step.

Thus, an embodiment according to Claims 1 or 13 provides a method of forming a film upon a substrate characterized by solving an inverse problem by using a uniform or a desired film-thickness distribution and the film-thickness distribution information obtained in advance at each relative position, to thereby determine the deposition time at each relative position.

Further, in an embodiment according to Claim 16, for example, the information on the film-thickness distribution per unit time is collected for the test substrate without rotating the

[1] Specification at page 8, lines 25-32.

test substrate at least once at each of the respective N arrangements represented by the coordinates X, Y, and the vector r_a, $\underline{\theta}$ in the preliminary step where N is an appropriate number.

Then, by solving the inverse problem through the use of the film-thickness distribution information so as to realize the uniform or desired film-thickness distribution to thereby determine the deposition time at each position, it is possible not only to form a thin film with a considerably uniform film-thickness distribution, but also to form a thin film with a desired film-thickness distribution.[2]

For example, according to an embodiment of Claim 1 or 13, it is possible to reduce the film-thickness fluctuation in the substrate with a diameter of 100 mm within only ±1%.[3] It is similarly possible to reduce the film-thickness fluctuation in the substrate with a diameter of 200 mm within only ±2.4%.[4]

Applicant respectfully submits that Kojima fails to teach or suggest each of the features of the independent claims.

Kojima discusses as prior art, a thin film forming apparatus in which a control signal corresponding to an oscillation pulse of a laser unit 10 is transmitted to an XY stage 12 through a control apparatus 13, and the XY stage 12 is driven based on the control signal and moves to the position of forming the thin film on the substrate at every laser pulse.[5] Kojima further describes that, in the case of the prior art, film formation parameters such as intensity of a condensed beam incident on a target, a condition for laser oscillation, a position of the target, and so on, have been set initially and thereafter these parameters are not controlled.[6]

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[2] Specification at page 9, lines 18-23.
[3] Specification at page 12, line 23 to page 13, line 24, and FIG. 2(C).
[4] Specification at page 13, line 25 to page 14, line 24, and FIG. 3(B).
[5] Kojima at column 1, line 57 to column 2, line 3, FIG. 148.
[6] Kojima at column 2, lines 63-66.

Kojima aims to allow delicate control of film quality[7] to allow for a change in composition or orientation of the film which depends on composition of the surface of the target or on a sudden change in energy of the particles incident on the substrate.[8] Kojima provides, in order to attain the above-mentioned object, film quality monitoring means which scans the substrate surface by laser beam irradiation and measures the reflected light by means of a CCD camera for monitoring the state of the film deposited on the substrate surface on a real time basis, and means for feeding back the result of monitoring to the film forming conditions.[9]

Moreover, Kojima discusses measuring means for measuring a component and nature of a plume generated from the target, analyzing means for analyzing the information obtained by the measuring means, and control means for controlling film forming parameters based on the result of analysis obtained by the analyzing means,[10] and Kojima further describes that the film forming parameters can be monitored at the site during the process for film formation, and optimal conditions for film formation can be obtained by feedback control.[11] Still further, Kojima discusses plume monitoring means for monitoring position of the plume, control means for processing the data monitored by the plume monitoring means and for outputting a control signal, and means for adjusting position and size of the plume based on the output signal from the control means.[12]

As described above, the data of film forming parameters used in the thin film forming apparatus described by Kojima does not correspond to film-thickness distribution information of a film deposited on a separate test substrate, which is obtained before the intended thin film is formed. Accordingly, Kojima fails to teach or suggest a "method of forming a film

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[7] Kojima at column 3, lines 12-15.
[8] Kojima at column 2, lines 66 to page 3, line 3.
[9] Kojima at column 5, line 59 to column 6, line 10.
[10] Kojima at column 9, lines 45-51.
[11] Kojima at column 9, lines 52-59.
[12] Kojima at column 9, lines 60-67

upon a substrate" that includes "obtaining in advance information on a distribution of a thickness of a film deposited upon a test substrate," as recited in Claims 1 and 13. The thin film forming apparatus disclosed by Kojima forms a film by using data of various thin film forming parameters measured or monitored at the site during the process for film formation.

Accordingly, Applicant respectfully submits Claims 1 and 13, and claims depending therefrom, patentably define over Kojima.

In addition, Applicant submits that Kojima neither teaches nor suggests any of a structure for obtaining the film-thickness of the deposit produced on the substrate within a unit time in each of the N (N: more than one) arrangements on the test substrate prepared for use in collecting information, and a structure for selecting a combination of the deposition times which is the closest to the desired film-thickness distribution, based on the film-thickness of the deposit produced within a unit time obtained by the above structure for obtaining the film thickness.

Accordingly, Applicant respectfully submits that independent Claims 1 and 13, and claims dependent therefrom are allowable.

Consequently, in light of the above discussions and in view of the present amendment this application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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